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[0020]

[Embodiment]

A first embodiment of the present invention will be explained with reference to Fig. 1 and Fig. 2.

[0021]

Fig. 1 is a block diagram illustrating a structure of a color video printer. The elements like those in the related art of Fig. 10 are designated by the like reference numerals.

[0022]

In Fig. 1, (1) is a reproduced video signal obtained from a video software which is available in the market, (2) a Y/C separation circuit for separating the reproduced video signal (1) to a luminance signal Y and a color signal C and (9a) is an AGC circuit consisting of a key pulse generating circuit (7) for generating a key pulse for AGC when the synchronous signal separated and output by the synchronous isolating circuit (14) is supplied, a pulse generating circuit (16a) for deleting the pulse only for the copy guard signal period from the key pulse generated, a detection object signal generating circuit (6) for generating the detection object signal with a pulse supplied from the pulse generating circuit (16a), a detecting circuit (5) for detecting the peak of the generated detection object signal, a comparator (4) for comparing and amplifying a voltage difference between the detecting circuit (5) and reference voltage (8) and a variable gain amplifier (3) of which gain is varied depending

on an output from the comparator (4).

[0023]

(10) designates a color demodulation circuit for generating color difference signals (R-Y, B-Y signals) from the separated color signal C, (11) to (13) designate respectively the generated Y(luminance) signal and R-Y, B-Y (color difference) signals. (15) designates a copy guard period generating circuit for generating the copy guard period signal (44) from the vertical synchronizing signal (43) separated by the synchronous separating circuit (14), (17) to (19) designate the A/D converter, (20) to (25) designate the buffer, (26) to (28) designate the D/A converter, (29) designates a Y color difference memory for storing the digital input video signal and (30) designates an SSG for supplying the reference synchronous pulse.

[0024]

(35) designates a copy guard adding means having the structure explained below.

[0025]

The copy guard adding means (35) is composed of an upper side copy guard adding circuit (35a) for adding the copy guard signal in the upper side portion from the pedestal level to the sync. signal (31) supplied from SSG (30), a lower side copy guard adding circuit (35b) for adding the copy guard signal in the lower side portion from the pedestal level to the sync signal (31), a mixer(35c) for mixing the upper side copy guard signal and Y signal and a synchronous signal

changeover switch (35d) for switching the synchronous signal (32) separated from the input video signal and the synchronous signal generated by (35a) and (35b).

[0026]

On the other hand, (36) designates an adjustment/conversion matrix circuit for generating R, G, B (red, green, blue) signals by adjusting brightness and color tone of the input Y signal and color difference signal; (34), an encoder circuit for generating a composite signal (37) from the synchronous signal input from the changeover switch (33a) and three signals (R, G, B) output from the adjustment/conversion matrix circuit (36); (38), a changeover switch for monitor through mode for providing an output in direct without passing a video printer circuit, D through mode for providing an output after A/D and D/A conversions and memory mode; (39), a selection changeover circuit for sequentially and selectively outputting three input signals (R,G,B) from the conversion matrix circuit (36); (40), an A/D converter; (41), an intermediate tone control circuit and (42), a thermo-sensitive head.

[0027]

Next, operations of the embodiment shown in Fig. 1 will be explained with reference to Fig. 2.

[0028]

The reproduced video signal (1) of a marketed video program in which the copy guard signal as shown in Fig. 2(a) is added is separated to the Y signal and C signal by a Y/C

separation circuit (2) and the Y signal is input to a synchronizing separator circuit(14) via a variable gain amplifier of the AGC circuit (9a). The synchronous signal (32) shown in Fig. 2(b) separated from the Y signal by the synchronizing separator circuit (14) is supplied to a key pulse generating circuit (7) to generate a key pulse (47) shown in Fig. 2(c) and is then supplied to a pulse generating circuit (16a). Meanwhile, the vertical synchronous signal (43) generated by the synchronizing separator circuit (14) is supplied to a copy guard period generating circuit (15) to output a copy guard period signal (44) shown in Fig. 2(d). This copy guard period signal (44) is supplied, together with the key pulse (47) explained above, to a pulse generating circuit (16a) to generate the pulse (45) shown in Fig. 2(e) where the pulse is deleted only for the copy guard period from the key pulse (47). This pulse (45) is supplied to the detection object signal generating circuit (6) to generate the detection object signal (46) having the peak level 100IRE shown in Fig. 2(f). The detecting circuit (5) detects the peak level of the detection object signal (46) and the comparator (4) compares an output of the detecting circuit (5) with the reference voltage (8). With this comparison value, the variable gain amplifier (3) determines the gain and outputs the Y signal.

[0029]

Since the peak level of the detection object signal (46) is almost constant at 100IRE as explained above, the gain

of the variable gain amplifier (3) is controlled to a constant value without relation to existence of the copy guard signal and therefore contrast is never varied.

[0030]

The C signal separated by the Y/C separating circuit (2) is converted by the color demodulating circuit to the R-Y signal (12) and B-Y signal (13). Moreover, the video element (level corresponding to 100 % while from the pedestal level) of the color difference signals (12), (13) and luminance signal (11) within the effective display area is converted to a digital signal by the A/D converters (17) to (19) and is then stored once as a digital video data to the memory (29) via the buffers (20) to (22). The video data read from the memory (29) is then converted to an analog signal by the D/A converters (26) to (28) via the buffers (23) to (25) to become the analog Y signal and R-Y signal, B-Y signal. Thereby, brightness and hue are adjusted by the adjustment/matrix circuit (36) and are then converted to three signals (R, G, B). The three signals R, G, B output from the adjustment/matrix signal (36) are then supplied to a selection changeover circuit (39) and then sequentially changed over and selected. Thereby, the selected signal is converted to a digital signal by the A/D converter (40) and three signals R, G, B are sequentially supplied to a thermosensitive head (42) via an intermediate tone control circuit (41) to obtain a printed image. On the other hand, the three signals R, G, B output from the adjustment/matrix

circuit (36) are then input to an encoder circuit (34) together with the synchronous signal.

[0031]

In the D through mode, the synchronous signal (32) separated by the synchronizing separator circuit (14) is input and a composite signal (37) to which the copy guard signal is added is then output. Moreover, in the memory mode, the synchronous signal (31) generated by SSG(30) with the copy guard adding means (35) is input to the upper copy guard adding circuit (35a) and lower copy guard adding circuit (35b) and thereby the upper copy guard signal and lower copy guard signal are output. The synchronous signal including the upper copy guard signal is added, by a mixer (35c), to the Y signal after the D/A conversion, then input to the encoder circuit (34) together with the synchronous signal including the lower copy guard signal and thereby a composite signal (37) to which the copy guard signal is added is then output. The D through mode and memory mode are switched by the changeover switch (35d). The video signal to which the copy guard signal is added is output to the external circuits via the changeover switch (38) for the D through mode, memory mode and monitor through mode.

[0032]

Therefore, good print image can be obtained even from the reproduced video signal of the marketed video program to which the copy guard signal is added. Moreover, since the input signal can be output in direct even in the monitor

through mode, D through mode and memory mode, not resulting in infringement of copyright.

[0033]

Fig. 3 is a block diagram of a color video printer as a second embodiment of the present invention.

[0034]

In this second embodiment, like the first embodiment, the Y signal separated by the Y/C separating circuit (2) is supplied to the synchronizing separator circuit (14). The synchronous signal separated by the synchronizing separator circuit (14) is then supplied to the key pulse generating circuit (7) and the copy guard period signal (44) generated by the copy guard period generating circuit (15) by the vertical synchronous signal (43) is supplied to a copy guard deleting circuit (16b) and the signal (48a) from which the copy guard signal element is deleted by the Y signal (11) is generated and is then supplied to the detection object signal generating circuit (6). The other portions are similar to those in the first embodiment.

[0035]

Operation of the AGC circuit (9b) of the second embodiment will be explained.

[0036]

The copy guard period generating circuit (15) generates a copy guard period signal (44) shown in Fig. 4(b) on the basis of the vertical synchronous signal (43) separated from the reproduced video signal (1) of the marketed video program

shown in Fig. 4(a) by the synchronizing separator circuit (14) and then supplies this signal to the copy guard deleting circuit (16b). The copy guard deleting circuit (16b) generates the signal (48) shown in Fig. 4(d) obtained by deleting only the copy guard signal from the Y signal (11) based on the input copy guard period signal (44) and then supplies the signal (48a) to the detection object signal generating circuit (6). In the same manner, the synchronous signal (32) including the copy guard signal separated by the synchronizing separator circuit (14) is supplied to the key pulse generating circuit (7) and is then supplied to the detection object signal generating circuit (6) as the key pulse (47). The detection object signal generating circuit (6) generates the detection object signal (49) shown in Fig. 4(c) of which peak level does not exceed 100IRE within the copy guard period from the input key pulse (47) and the signal (48a) from which only the copy guard signal element is deleted. The generated detection object signal (49) is subjected to the peak level detection by the detecting circuit (5), an output of the detecting circuit (5) is compared with the reference voltage (8) with the comparator (4) and the gain of the variable gain amplifier (3) is determined and the Y signal (11) is then output. The peak level of this detection object signal (49) is almost constant at 100IRE and therefore the gain of the variable gain amplifier (3) becomes constant without relation to the copy guard signal. Moreover, contrast is never varied and thereby good print image can

be obtained.

[0037]

Fig. 5 is a block diagram of a color video printer as the third embodiment of the present invention.

[0038]

Operation of the AGC circuit (9c) as the third embodiment will then be explained with reference to Fig. 6. Even in this embodiment, like the first embodiment, the Y signal (1) shown in Fig. 6(a) separated by the Y/C separating circuit (2) is supplied to the synchronizing separator circuit (14). The synchronizing circuit (32) separated by the synchronizing separator circuit (14) is supplied to the key pulse generating circuit (7) to generate the key pulse (47) shown in Fig. 6(c). The key pulse (47) is supplied to the detection object signal generating circuit (6) and thereby the detection object signal (48b), shown in Fig. 6(d), of which peak level is exceeding 100IRE to a large extent is generated and it is then supplied to the peak pulse deleting circuit (16c). Moreover, the copy guard period signal (44), shown in Fig. 6(b), generated by the copy guard period generating circuit (15) with the vertical synchronous signal (43) is also supplied to the peak pulse deleting circuit (16c). The peak pulse deleting circuit (16c) deletes the peak pulse element of the detection object signal (48b) exceeding 100IRE to a large extent and generates the detection object signal (49), shown in Fig. 6(e), of which peak level does not exceed 100IRE. The peak level of the generated detection object

signal (49) is detected by the detecting circuit (5), the comparator (4) compares an output of the detecting circuit (5) with the reference voltage (8) to determine the gain of the variable gain amplifier (3) and output the Y signal (11). Since the peak level of the detection object signal (49) is almost constant at 100IRE, the gain of the variable gain amplifier (3) becomes constant without relation to existence of the copy guard signal and thereby the contrast is never varied and good print image can be obtained.

[0039]

Fig. 7 is a block diagram of a color video printer as the fourth embodiment of the present invention. In this embodiment, the AGC circuit (9) is similar to that of the first, second and third embodiments.

[0040]

The reproduced video signal (1) of the marketed video program is separated to the Y signal and color difference signal by the Y/C separating circuit (2). The AGC circuit (9) determines the gain by the operations explained in the first, second and third embodiments using the synchronous signal supplied from the synchronizing separator circuit (14) and the copy guard period signal supplied from the copy guard period generating circuit (15). The Y signal (11) input to the AGC circuit (9) is kept constant in its contrast and is then supplied to the matrix circuit (50). Moreover, the color difference signal supplied to the color demodulating circuit (10) is separated to the R-Y signal (12) and B-Y signal

(13) and these signals are then supplied to the matrix circuit (50). The matrix circuit (50) converts the input Y signal (11), R-Y signal (12) and B-Y signal (13) to three signals R, G, B. Only the effective display area period of these signals is converted to the digital signal by the A/D converters (51) to (53) and are then stored as the digital video data in the RGB memory (54). The video data of R,G, B stored in the memory (54) is sequentially read, in one hand, by the selective changeover circuit (55) and the three signals R,G,B are then supplied to the thermosensitive head (57) via the intermediate tone control circuit (56). Thereby a good print image can be obtained. On the other hand, the three signals R,G,B stored in the memory (54) are converted to analog signal by the D/A converters (58) to (60) and are then supplied to the matrix circuit (61) for conversion into the Y color difference signal, R-Y signal and B-Y signal. As is also explained in regard to the first, second and third embodiments, the Y color difference signal is mixed, by a mixer (35c) in the copy guard signal adding means (35), with the upper copy guard signal generated by the upper copy guard adding circuit (35a) and are then input to the encoder circuit (34) together with the R-Y signal and B-Y signal. The encoder circuit (34) generates a composite signal (37), since it receives an input, in the memory mode for reading the video data stored in the memory (54), of the synchronous signal to which the lower copy guard signal is added by the lower copy guard adding circuit (35b) based on the reference sync.

Signal supplied from SSG(30) and receives supply of the synchronous signal separated by the synchronizing separator circuit (14), in the D through mode, by the selection changeover switch (35d) depending on each mode. Thereby, the video signal to which the copy guard signal is added as in the case of the reproduced video signal (1) of the marketed video program can be output via the changeover switch (38) for the memory mode, D through mode and monitor through mode.

[0041]

Fig. 8 is a block diagram of a color video printer as the fifth embodiment of the present invention. Operation of the AGC circuit(9c) as the fifth embodiment will be explained below.

[0042]

Like the first embodiment, in this embodiment, the Y signal (1) separated by the Y/C separating circuit (2) is also supplied to a synchronizing separator circuit (14). The synchronous signal (32) separated by the synchronizing separator circuit (14) is input to a guard pulse eliminating circuit (16e) and it is then input to the key pulse generating circuit (7) after only the copy guard pulse of which pulse width is shorter than the duration (5 μ sec) of the normal synchronous signal is eliminated. In this embodiment, since the copy guard pulse is about 2 μ sec, the guard pulse eliminating circuit (16e) is structured to eliminate the pulse of 3 μ sec or less. The key pulse generated by the key pulse generating circuit (7) is supplied to the detection

object signal generating circuit (6), but the key pulse is eliminated during the period where the copy guard signal is added. Therefore, the peak level of the detection object signal generated becomes equal to 100IRE and it is detected and compared like the other embodiments. Thereby, gain of the variable gain amplifier (3) is determined and the Y signal (11) is output. Since the peak level of the detection object signal is constant almost to 100IRE, gain of the variable gain amplifier (3) becomes constant without relation to existence of the copy guard signal and thereby good print image without variation of contrast can be obtained.

[0043]

Fig. 9 is a block diagram of a color video printer as the six embodiment of the present invention. The AGC circuit (9a) of the six embodiment is same as that of the first embodiment. In the AGC circuit (9a), the Y signal (11) which is kept constant in its contrast without relation to the copy guard signal, R-Y signal (12), B-Y signal (13) are converted to the digital signal by the A/D converters (17) to (19) (the Y signal is converted by the A/D converter up to the white 100% level from the sync. Chip level) and is then input to a full size memory (29b). In this case, the full size memory (29b) stores the vertical synchronous signal element including the copy guard signal period. Capacity of the full size memory (29) of this embodiment has a structure using nine blocks of 256-pit which can sufficiently store the copy guard signal.

[0044]

The signal output from the full size memory (29) is converted to the analog signal by the D/A converters (26) to (28), then input to the adjustment/matrix circuit (36) for adjustment of brightness and hue and then converted to the three signals R, G, B. The three signals R, G, B output from the adjustment/matrix circuit (36) are supplied, in one hand, to the selective changeover circuit (39), sequentially selected and converted to the digital signal by the A/D converter (40), and then supplied to the thermosensitive head (42) via the intermediate tone control circuit (41) to obtain the print image.

[0045]

On the other hand, the three signals R, G, B output from the adjustment/matrix circuit (36) are input to the encoder circuit (34), converted to the composite signal (37) and are then output to the external circuit via the changeover switch (38) for the monitor through mode. Using the full size memory (29b), the input signal can be output in direct to the external circuits without missing of the copy guard signal because the synchronous signal including the copy guard signal can totally be stored. Therefore, infringement of copyright does not occur even in the monitor mode, D through mode and memory mode. In addition, in this embodiment, the similar effect can also be obtained even when the AGC circuit (9a) is identical to the AGC circuits (9b) or (9c) of the second and third embodiments.

[0046]

As explained above, good print image can be obtained even from the reproduced video signal input of the marketed video program with the copy guard system. In addition, since the input signal is output in direct even in the monitor through mode, D through mode and memory mode, infringement of copyright does not occur.

[0047]

[Effect of the Invention]

As explained above, according to the present invention, in the color video printer comprising the AGC circuit, it is possible to provide a color video printer which can assure the good print image even from the video tape and a marketed video program such as optical disc to which the copy guard signal which may result in a cause of irregular variation of contrast is added.

[0048]

Moreover, since the input signal is output in direct, the apparatus of the present invention is no longer used as a dubbing machine which infringes the copyright.

Fig. 1:

1: Reproducing VTR; 2: Y/C separation;

3: Variable amplifier; 4: Comparator; 5: Detecting circuit; 6: Detection object signal generating circuit;

7: Key pulse generation; 10: Color demodulation;

14: Synchronizing separation;

15: Copy guard period generation; 20: Buffer;

29: Y color difference memory; 34: Encoder;

35a: Upper copy guard addition; 35: Mixer;

35b: Lower copy guard addition;

36: Adjustment/matrix; 39: Selective changeover;

41: Intermediate tone control;

42: Thermosensitive head;

Fig. 2:

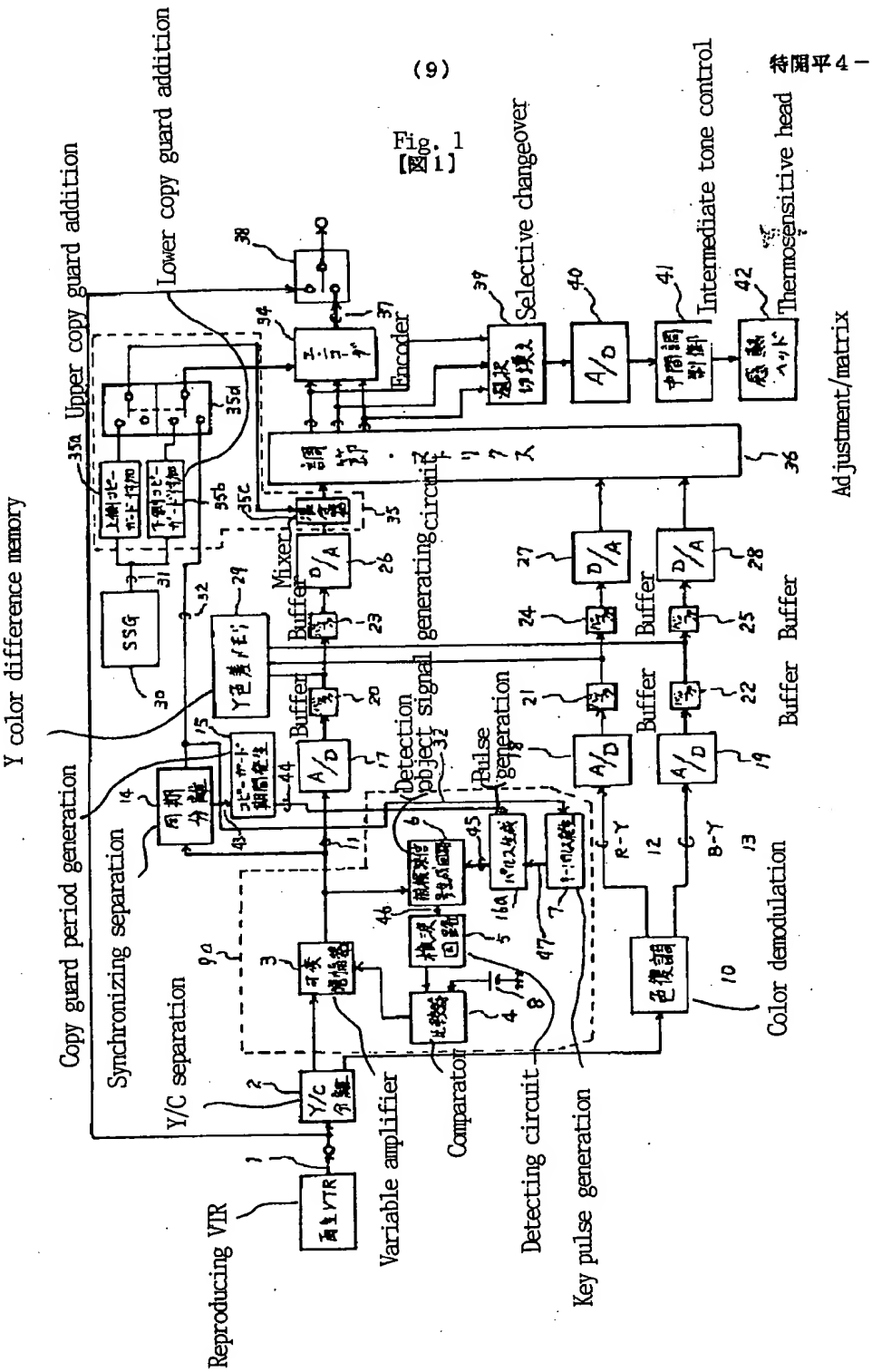
1: Upper copy guard signal; 2: Lower copy guard signal;

3: Time;

Fig. 11:

1: Normal case; 2: when copy guard signal is added;

Fig. 1
【図1】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Copy guard period generation
Synchronizing separation
Y/C separation
Reproducing VTR
Variable amplifier
Comparator
Detecting circuit
Key pulse generation
Color demodulation
Upper copy guard addition
Lower copy guard addition
Encoder
Selective changeover
Intermediate tone control
Thermosensitive head
Adjustment/matrix
Mixer
Buffer
Detection object signal generating circuit
Pulse generation
SSG

Fig. 2
【図2】

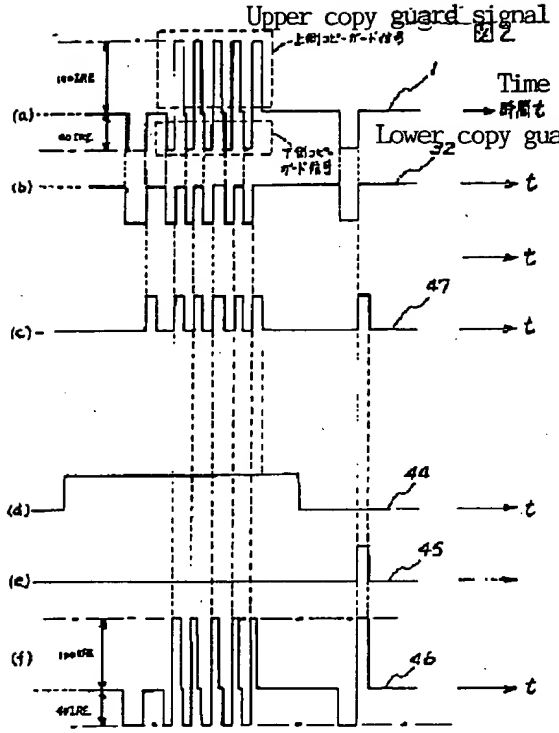


Fig. 4
【図4】

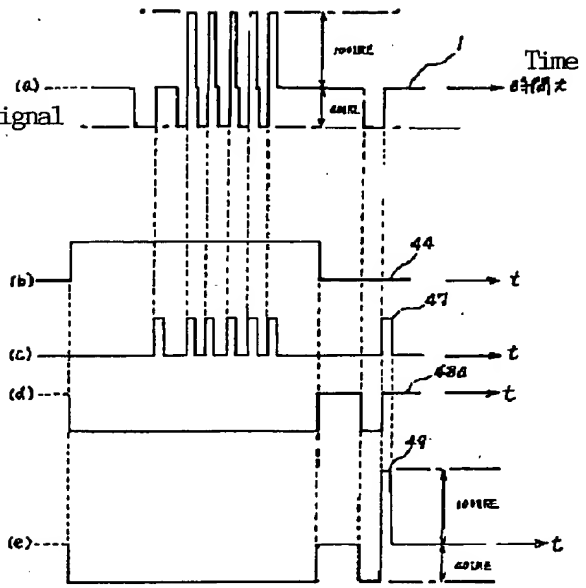


Fig. 6
【図6】

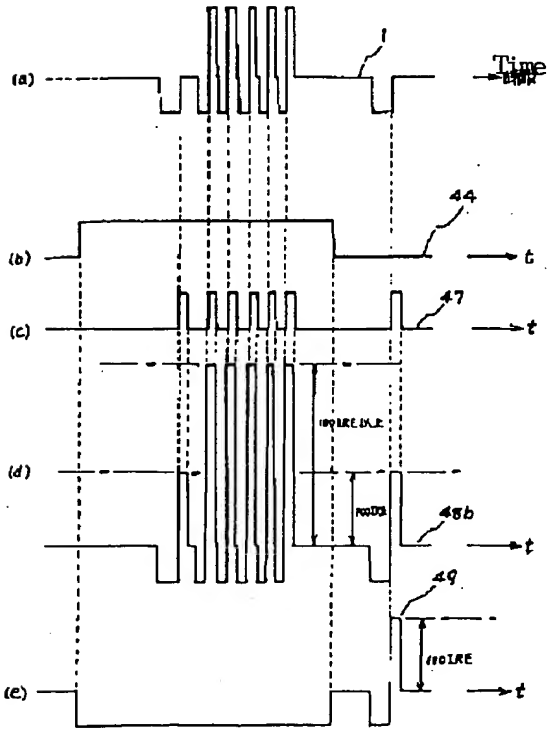
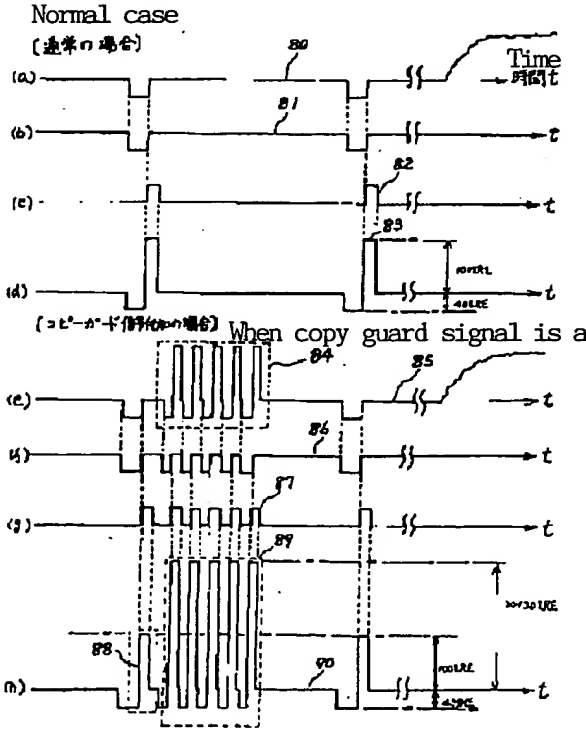


Fig. 11
【図11】



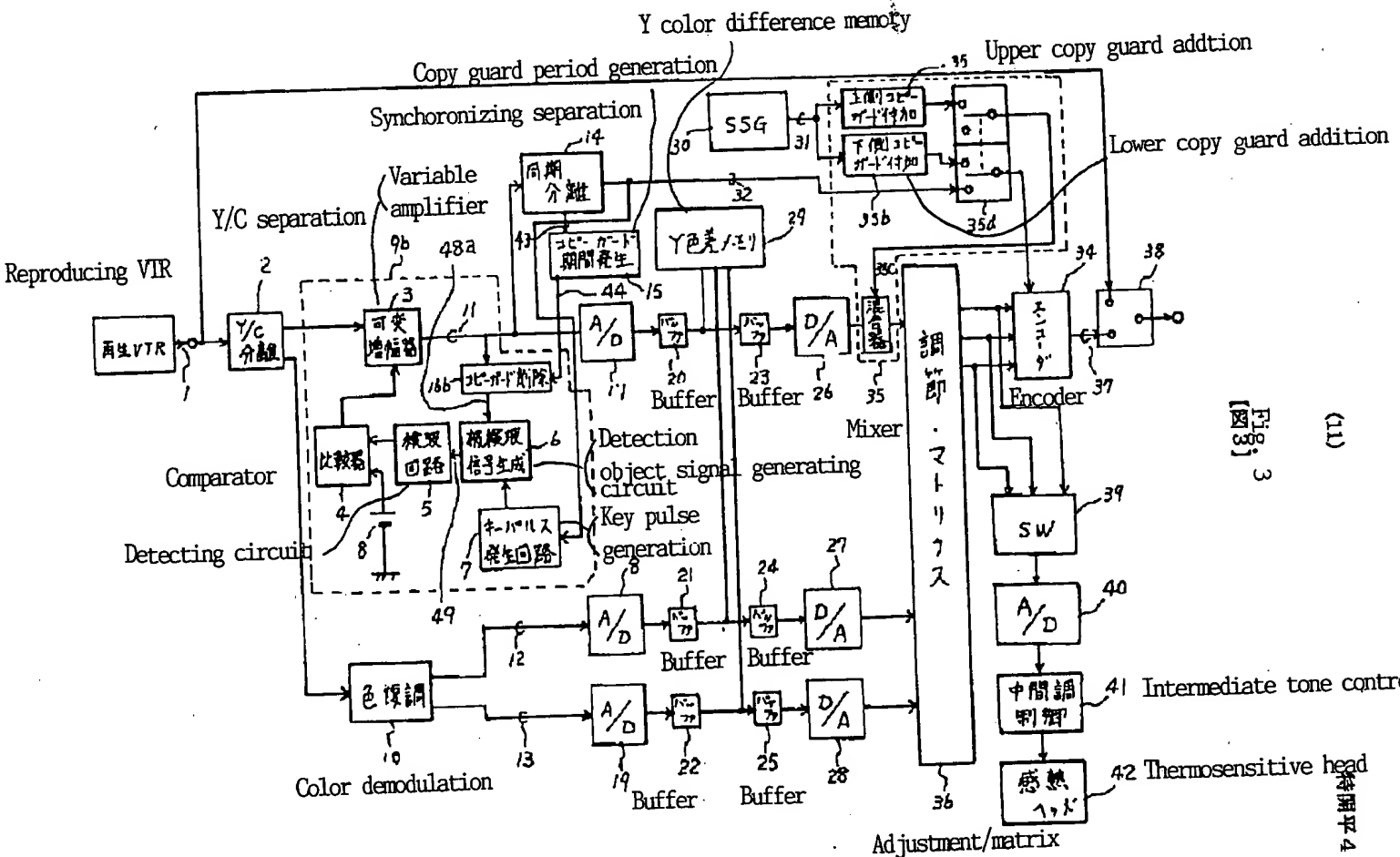


Fig. 3
【図3】

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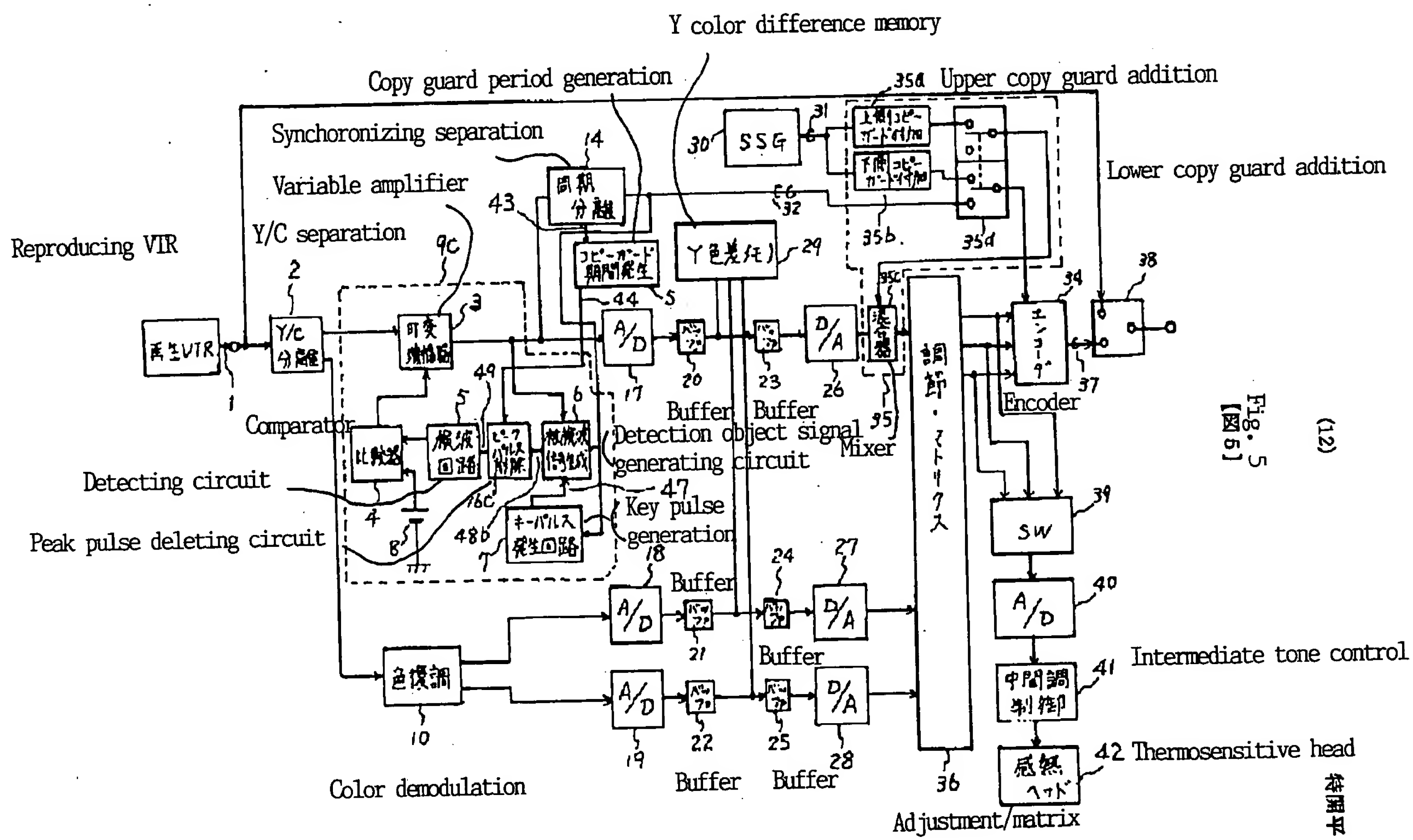
Fig. 5
【図5】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Upper copy guard addition
Synchoronizing separation
Variable amplifier
Lower copy guard addition
Y/C separation
Reproducing VIR
Comparator
Buffer
Buffer
Detection object signal
generating circuit
Mixer
Encoder
Detecting circuit
Key pulse
generation
Peak pulse deleting circuit
Buffer
Buffer
Intermediate tone control
42 Thermosensitive head
Color demodulation
Buffer
Buffer
Adjustment/matrix

Fig. 7
【図7】

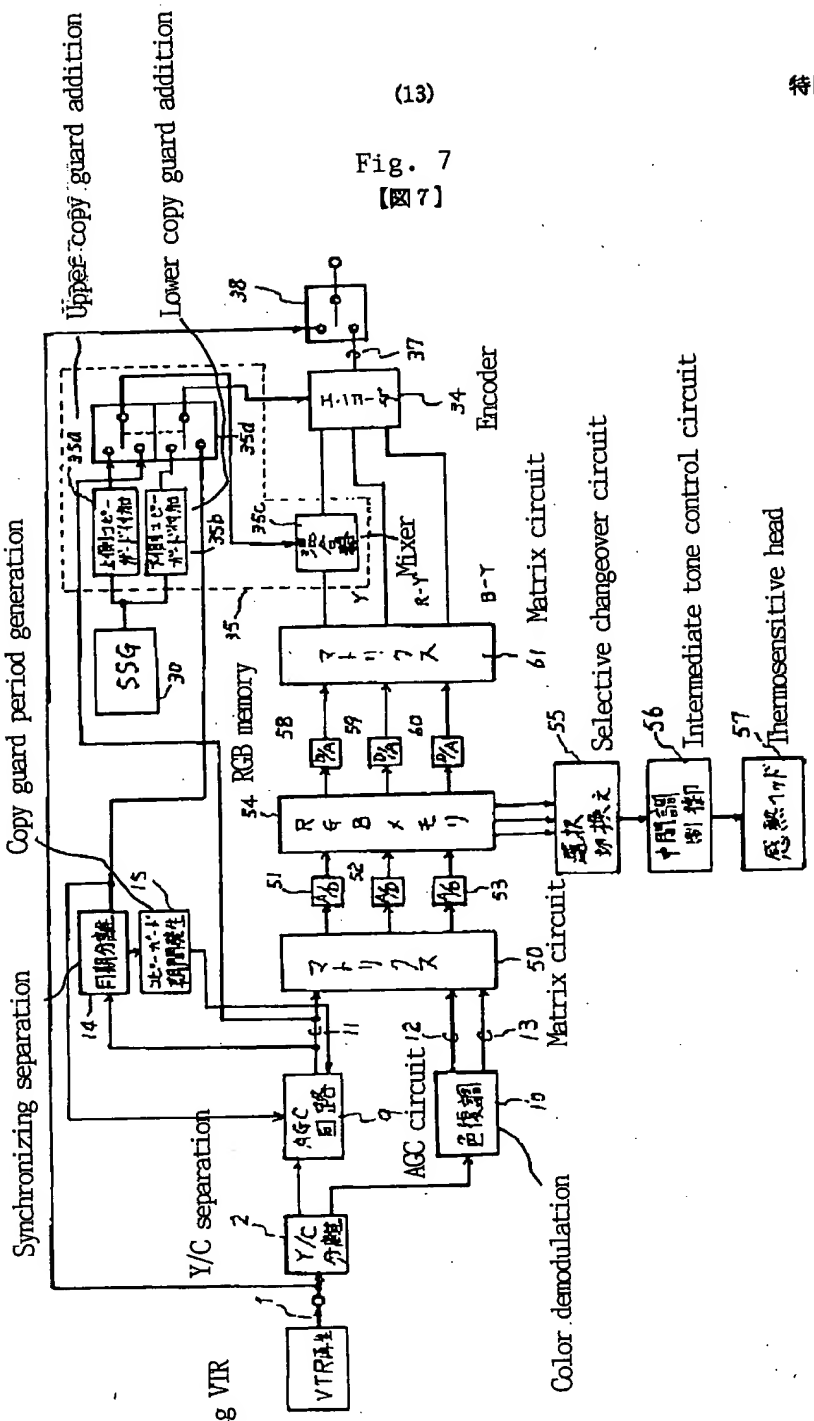
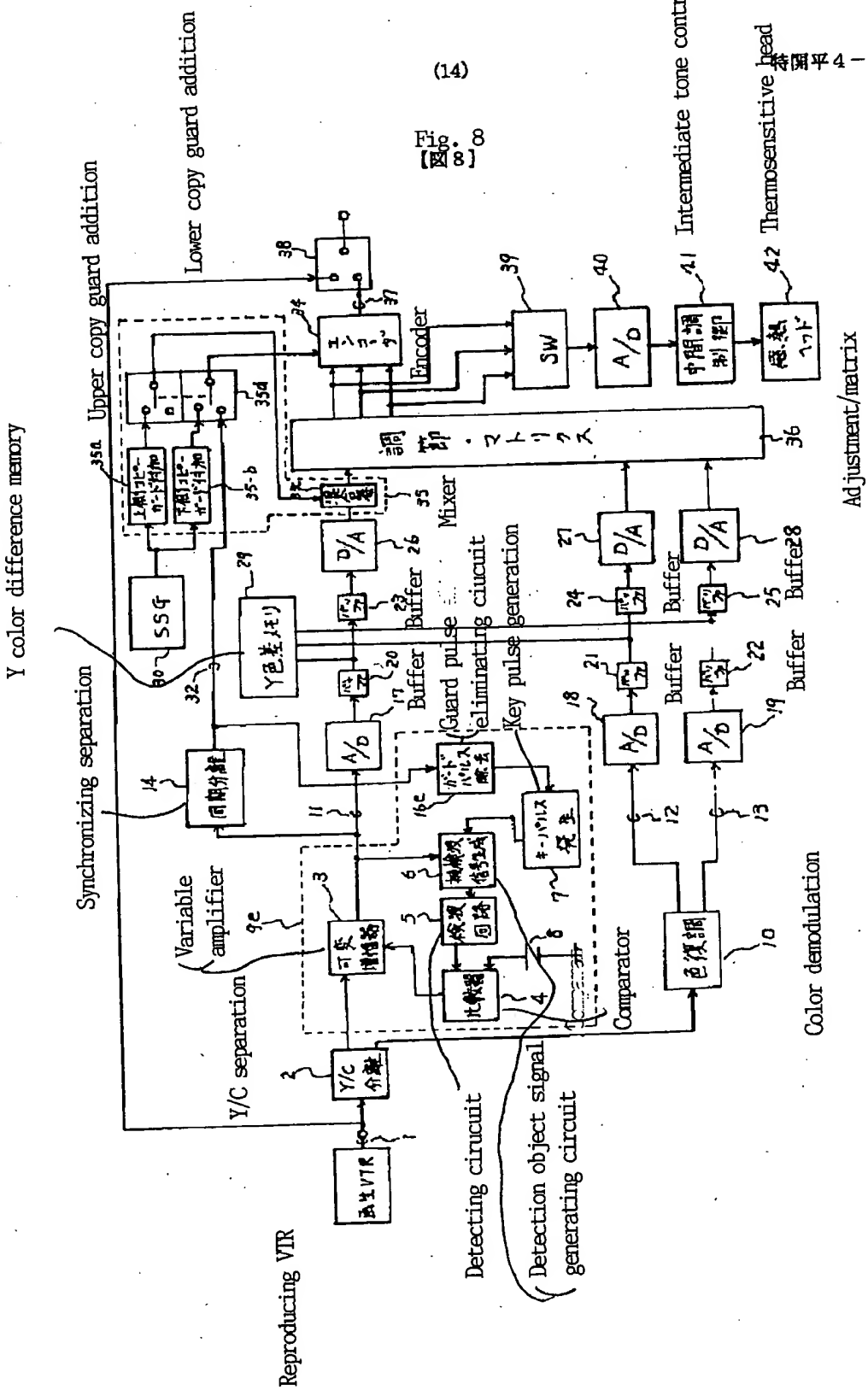

Upper copy guard addition
Lower copy guard addition
Copy guard period generation
Synchronizing separation
Y/C separation
AGC circuit
Color demodulation
Reproducing VTR
Matrix circuit
Matrix circuit
Selective changeover circuit
Intermediate tone control circuit
Thermosensitive head
Encoder
Mixer
RGB memory
SSG
Y/C分離
AGC回路
色復調
VTR再生
Thermosensitive head

Fig. 8
【図8】


Y color difference memory
Synchronizing separation
Variable amplifier
Y/C separation
Reproducing VTR
Detecting circuit
Detection object signal generating circuit
Comparator
Color demodulation
Guard pulse elimination ciucuit
Key pulse generation
Buffer
Mixer
Encoder
Upper copy guard addition
Lower copy guard addition
SW
Intermediate tone control
Thermosensitive head
Adjustment/matrix

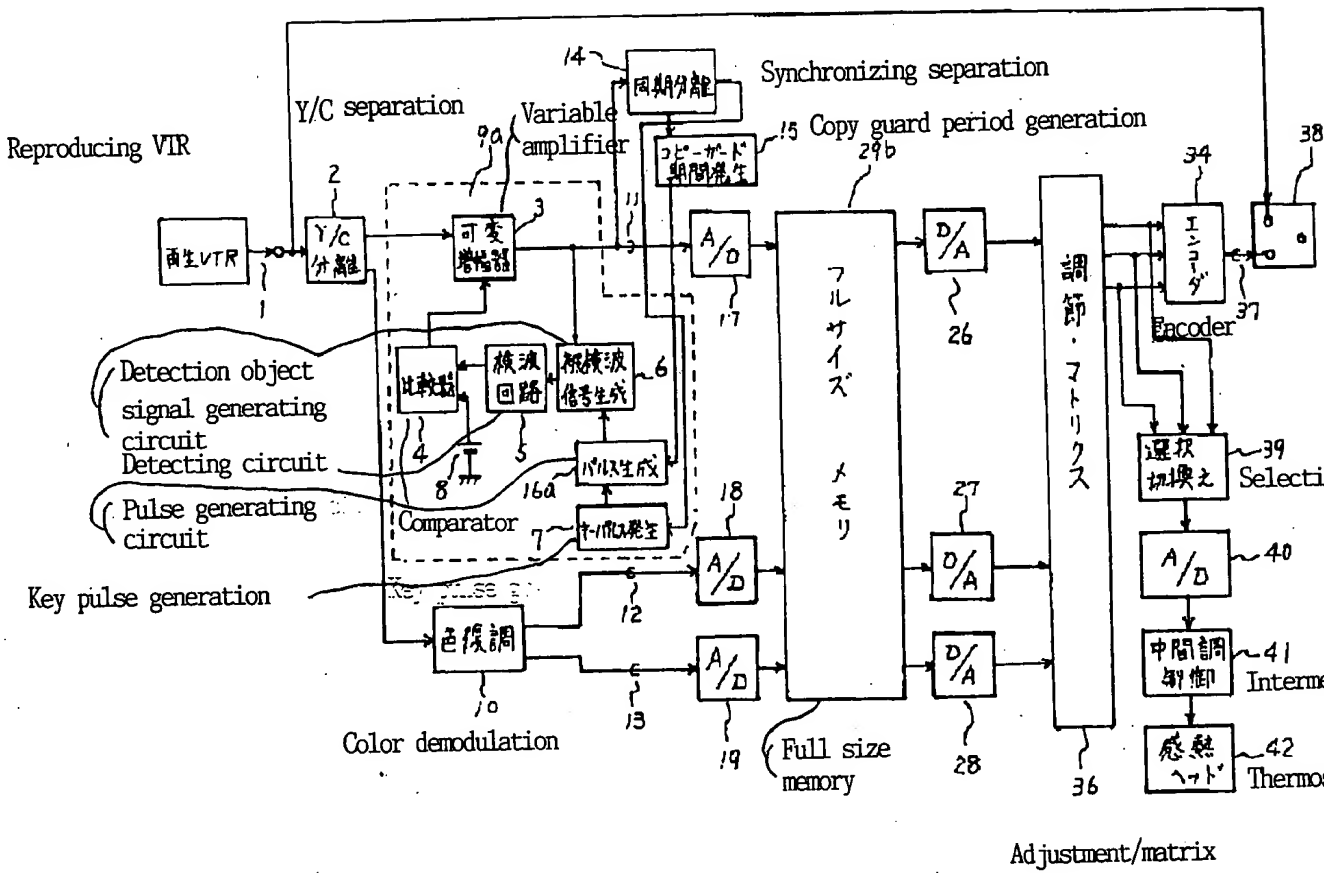


Fig. 9
【図9】

(15)

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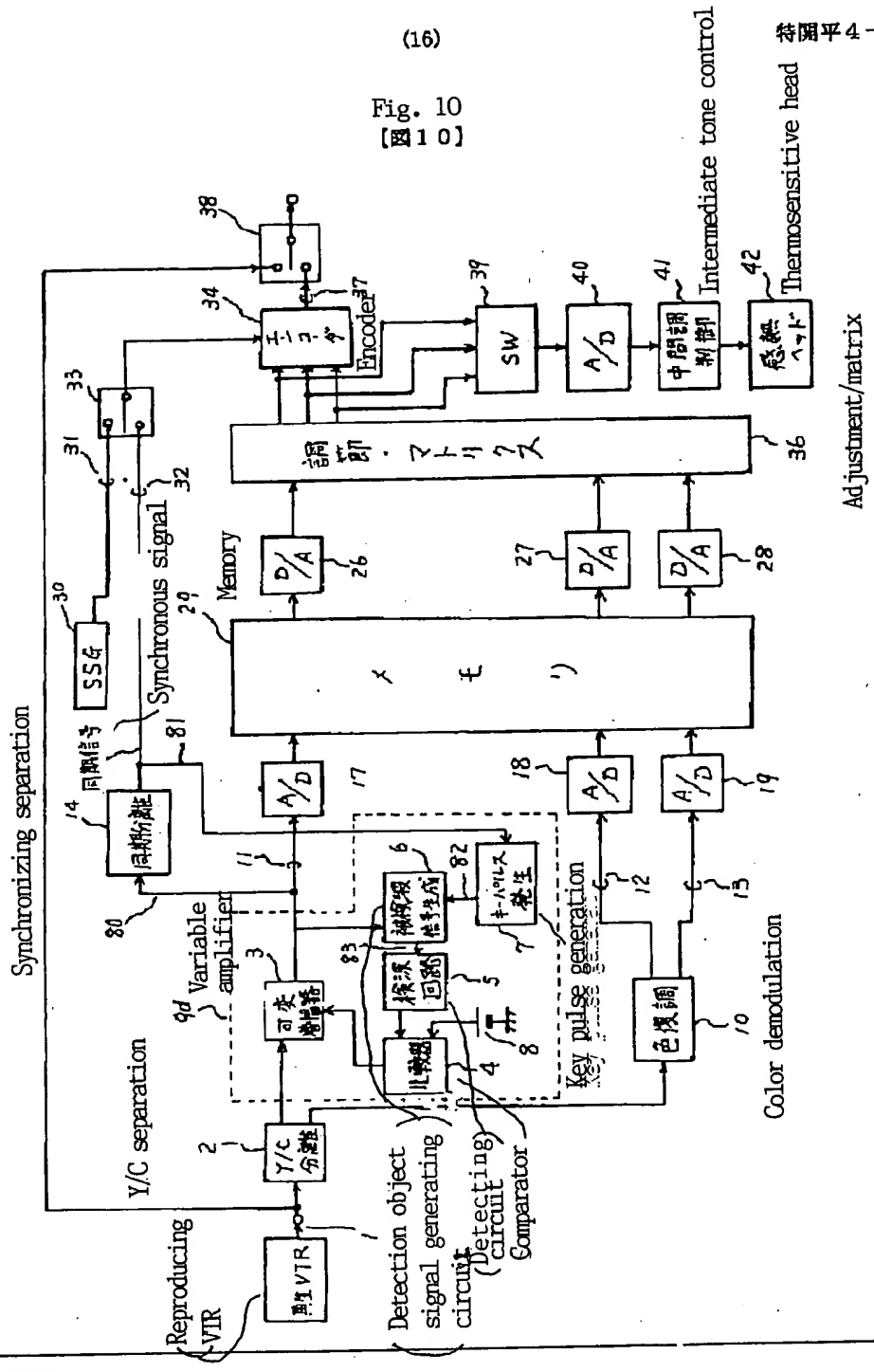
Fig. 10
【図10】



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9/12				
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		7117－5K	H04L 9/00	Z